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October 26, 2000

BOX PATENT APPLICATION

Assistant Commissioner for Patents
Washington, D.C. 20231

Re: Application of Shinsuke HENMI, Kyouhei YAMAMOTO and
Toshinori TANAKA
BRUSH HOLDER FOR DYNAMO-ELECTRIC MACHINE
Our Ref. Q61431

Dear Sir:

Attached hereto is the application identified above including 17 pages of specification, claims and Abstract, 11 sheets of formal drawing (Figures 1-14), executed Assignment and PTO 1595 form, executed Declaration/Power of Attorney, an Information Disclosure Statement and PTO form 1449, and the certified priority document.

The Government filing fee is calculated as follows:

Total claims	20	-	20	=	x	\$18.00	=	\$0.00
Independent claims	1	-	3	=	x	\$80.00	=	\$0.00
Base Fee								\$710.00
TOTAL FILING FEE								\$710.00
Recordation of Assignment								\$40.00
TOTAL FEE								\$750.00

Checks for the statutory filing fee of **\$710.00** and Assignment recordation fee of **\$40.00** are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 and 1.17 and any petitions for extension of time under 37 C.F.R. § 1.136 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from August 29, 2000 based on Japanese Application No. 2000-258695. The priority document is enclosed herewith.

Respectfully submitted,
SUGHRUE, MION, ZINN,
MACPEAK & SEAS, PLLC
Attorneys for Applicant

By: Robert J. Seas, Jr.
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Registration No. 21,092

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caulking. After assembling the metallic brush holder 23, the spring 27 is assembled inside the metallic brush holder 23, and thereafter the brush 22 is assembled. A position where the terminal plate 26 and the pigtail 25 are welded is a side of the metallic brush holder 23.

Because the conventional brush holder is constructed as described above, the terminal plate 26 is connected to the pigtail on a right side or a left side of the brush 22. Therefore, sliding of the brush was affected depending on a state of the pigtail, whereby there were problems that an operating noise of a motor and ripples of torque were increased, and that, in a dynamo-electric machine rotatable in both directions, differences of torques, of the numbers of revolutions, of operating noises, and of ripples of torques were different with respect to the rotating directions.

SUMMARY OF THE INVENTION

It is an object of the present invention to solve the above-mentioned problems inherent in the conventional technique and to provide a brush holder, which can reduce ripples of torque and operating noises in a dynamo-electric machine.

Another object of the present invention is to provide a brush holder, which can reduce differences of numbers of revolutions and torques with respect to both directions in a dynamo-electric machine rotatable in the both directions, also can reduce differences of ripples

of torque with respect to the directions, and also can
reduce differences of operating noises with respect to
the directions, wherein when the brush holder is applied
to the motor for an electric power steering, effects
5 demonstrated by the brush holder device are remarkable.

According to a first aspect of the present
invention, there is provided a brush holder, wherein a
spring and a brush are set in a brush holder base, and a
terminal plate and a pigtail are connected in an area
10 within 90° from an introducing portion of the pigtail in
the brush toward an outside of the brush holder.

According to a second aspect of the present
invention, there is provided the brush holder device for
the dynamo-electric machine, wherein the terminal and the
15 pigtail are connected in an area around a sliding axis of
the brush within the width of the brush.

According to a third aspect of the present
invention, there is provided the brush holder for the
dynamo-electric machine, wherein the pigtail is
20 introduced from the brush in a direction toward a motor
shaft.

According to a fourth aspect of the present
invention, there is provided the brush holder for the
dynamo-electric machine, wherein a column is located in
25 the terminal plate to connect with the pigtail.

According to a fifth aspect of the present
invention, there is provided the brush holder for the

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dynamo-electric machine, wherein the pigtail is introduced from a backside of the brush.

According to a sixth aspect of the present invention, there is provided the brush holder for the
5 dynamo-electric machine, wherein the dynamo-electric machine is rotatable in both directions.

According to a seventh aspect of the present invention, there is provided the brush holder for the dynamo-electric machine, wherein the dynamo-electric
10 machine is a motor for an electric power steering.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by
15 reference to the following detailed description when considered in connection with the accompanied drawings, wherein:

Figure 1 is a plan view illustrating a brush holder for a dynamo-electric machine according to Embodiment 1
20 of the present invention in a disassembled state;

Figure 2 is a side view of the brush holder of the dynamo-electric machine according to Embodiment 1 in a disassembled state;

Figure 3 is a plan view of the brush holder of the
25 dynamo-electric machine according to Embodiment 1 in a completely assembled state;

Figure 4 is a cross-sectional view of the brush

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holder in Figure 3 taken along a line A-A;

Figure 5 is a plan view illustrating a brush holder according to Embodiment 2;

Figure 6 is a cross-sectional view of the brush
5 holder illustrated in Figure 5 taken along a line C-C;

Figure 7 is a plan view illustrating plates;

Figure 8 is a perspective view illustrating a state that a metallic brush holder is assembled with a plate;

Figure 9 is a plan view illustrating a brush holder
10 according to Embodiment 3 of the present invention;

Figure 10 is a side view illustrating a brush of a brush holder according to Embodiment 3 of the present invention;

Figure 11 is a cross-sectional view of the brush
15 holder illustrated in Figure 9 taken along a line D-D;

Figure 12a is a plan view illustrating a conventional brush holder of a dynamo-electric machine;

Figure 12b is a plan view illustrating the conventional brush holder of the dynamo-electric machine;

20 Figure 13 is a perspective view illustrating a state that a conventional metallic brush holder is assembled with a conventional plate; and

Figure 14 is a side cross-sectional view illustrating the state that the conventional metallic
25 brush holder is assembled with the conventional plate.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A detailed explanation will be given of preferred

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embodiments of the present invention in reference to Figure 1 through 11 as follows, wherein the same numerical references are used for the same or similar portions and descriptions of these portions is omitted.

5 EMBODIMENT 1

Figure 1 is a plan view of the brush holder of the dynamo-electric machine according to Embodiment 1 of the present invention in the disassembled state provided to show various components of the brush holder. Figure 2 is
10 the side view of the brush holder in the disassembled state. Figure 3 is a plan view illustrating the brush holder which is completed by assembling various components. Figure 4 is the cross-sectional view taken along the line A-A of the brush holder illustrated in
15 Figure 3.

In the figures, numerical reference 1 designates a first terminal plate; numerical reference 2 designates a brush holder base; numerical reference 3 designates a second terminal plate; numerical reference 4 designates a
20 spring; numerical reference 5 designates a step for temporal tacking, located in the brush holder base 2; numerical reference 6 designates a brush; and numerical reference 7 designates a brush holder cover.

As illustrated in the figures, a terminal plate 1,
25 i.e. the first terminal plate, is set in a lower portion of the brush holder base 2, made of a thermo-set resin such as phenol as shown in Figure 2, and fixed by

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respectively caulking at seven positions, namely protrusions 1a through 1g of the terminal plate 1 and holes 2a through 2g of the brush holder base 2.

In the next, a terminal plate 3, i.e. the second
5 terminal plate, which is different from the terminal plate 1, is inserted from an upper side of the brush holder base 2. In the next, the spring 4 is set in the step for temporary tacking 5 from the upper side. In the next, the pigtail 6a of the brush 6 is welded to columns
10 1a and 3a of the terminal plate 1 and the terminal plate 3. Thus welded pigtail 6a is set from an upper side of the brush holder as illustrated in Figure 4. Thereafter, the terminal plate 1 is connected to the terminal plate 3 by welding at a portion B, and finally the brush holder
15 cover 7, made of the thermo-set resin such as phenol, is set.

As illustrated in Figure 3, the terminal plate 13 is connected to the pigtail 6a in an area within 90° from an introducing portion of the pigtail in the brush 6,
20 wherein the pigtail 6a is introduced in a direction of a motor shaft. Accordingly, it is possible to reduce a bad influence against a sliding motion of the brush 6 caused by flexibility of the pigtail 6a and vibration of the brush 6 in radial directions, whereby operating noises
25 and ripples of torque in the dynamo-electric machine can be reduced. Further, because all pigtails extend in radial directions, in a dynamo-electric machine rotatable

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in both directions, differences of numbers of revolutions, of torques, of ripples of the torques, and of operating noises between the directions can be reduced.

5 Further, although an example that four brushes are used as illustrated above, the present invention is not limited to the brush holder having four brushes.

Further, the pigtail 6a is connected to the columns 1a, 3a of the terminal plates in an area around a sliding
10 axis of the brush 6 within the width 6b of the brush and in a backside of the introducing portion of the pigtail in the brush 6.

According to the present invention, it is possible to reduce ripples of torque and operating noises by
15 connecting the pigtail 6a in the area within 90° on a backside from the introducing portion of the pigtail from the brush 6.

Further, by introducing the pigtail 6a from the brush 6 in the direction toward the motor shaft and
20 connecting a tip of the pigtail 6a to the terminals 1, 3 in the area within 90° in the backside from the introducing portion of the pigtail in the brush 6, it is possible to reduce ripples of torque and operating noises in the dynamo-electric machine.

25 Further, in the dynamo-electric machine rotatable in both directions, by connecting the pigtail 6a to the terminals 1, 3 in the area within 90° on the backside

5 ripples of torques, and of operating noises with respect
to the directions because the pigtails 6a of all brushes
6 have the same or substantially the same shapes.

10 dynamo-electric machine for an electric power steering,
rotatable in both directions.

EMBODIMENT 2

15 invention. Figure 6 is the cross-sectional view taken
along the line C-C of the brush holder illustrated in
Figure 5. Embodiment 2 is an improvement of a part of
the conventional brush holder illustrated in Figures 12
through 14.

20 In the Figures, numerical reference 8 designates a
brush holder base; numerical reference 9 designates a
brush; numerical reference 10 designates a metallic brush
holder; numerical reference 11 designates a plate;
numerical reference 12 designates a pigtail; numerical
25 reference 13 designates a terminal plate; and numerical
reference 14 designates a spring.

Figure 7 is a plan view illustrating the plate 11.

Figure 8 is a perspective view illustrating a state that the metallic brush holder 10 and the plate 11 are disassembled to show how these are assembled.

As illustrated in Figure 12, in the conventional
5 brush holder, the pigtail 25 is directly welded to the terminal plate 26. However, in Embodiment 2, a column 11a of the plate 11 is elongated in comparison with the conventional brush holder, the column 11a is welded to the pigtail 12, a protrusion 11b is formed in a part of
10 the plate 11, and the pigtail 12 is connected to the terminal plate 13 by welding the protrusion 11b to the terminal plate 13.

Accordingly, in a manner similar to that in Embodiment 1, the pigtail 12 is welded in an area within
15 90° on a backside from an introducing portion of the pigtail in the brush 9, whereby it is possible to introduce the pigtail 12 in a direction toward a motor shaft.

Although an example that four brushes are used is
20 described above, the brush holder according to the present invention is not limited to that having four brushes.

EMBODIMENT 3

Figure 9 is the plan view illustrating the brush
25 holder according to Embodiment 3 of the present invention. Figure 10 is a side view illustrating the brush. Figure 11 is the cross-sectional view of the

brush holder illustrated in Figure 9 taken along the line D-D. According to Embodiment 3, a structure is substantially the same as that in Embodiment 1. However it is different from that of Embodiment 1 at a point that
5 the pigtail 6a is introduced from a backside of the brush 6 as illustrated in Figure 10.

As illustrated in the figures, the pigtail 6a is introduced in a direction of a sliding axis from the brush 6, and is welded to the terminals 1 and 3 in an
10 area within 90° in the backside from an introducing portion of the pigtail in the brush 6. Although in the above structure, an example that four brushes are used is shown, the brush holder according to Embodiment 3 is not limited to that having four brushes.

15 As described, according to Embodiment 3, the pigtail 6a is introduced in the sliding axis of the brush from the brush 6, and the pigtail 6a is connected to the terminals 1 and 3 in the area within 90° on the backside from the introducing portion of the pigtail in the brush
20 6, whereby it is possible to reduce ripples of torque and an operating noise of a dynamo-electric machine.

In Embodiments 1 through 3, the examples that the pigtail is connected to the terminal by welding, the connection is not limited to welding and may be
25 connections such as caulking or screwing.

Further, the example that the connection is located in the area within 90° on the backside from the

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invention is that the pigtail is easily connected to the

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the present invention are possible in light of the above

teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

5 The entire disclosure of Japanese Patent Application No. 2000-258695 filed on August 29, 2000 including specification, claims, drawings and summary are incorporated herein by reference in its entirety.

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WHAT IS CLAIMED IS:

1. A brush holder for a dynamo-electric machine, wherein a spring and a brush are set in a brush holder base, and a terminal plate and a pigtail are connected in an area
5 within 90° from an introducing portion of the pigtail in the brush toward an outside of the brush holder.
2. The brush holder for the dynamo-electric machine according to Claim 1, wherein the terminal and the pigtail are connected in an area around a sliding axis of
10 the brush within the width of the brush.
3. The brush holder for the dynamo-electric machine according to Claim 1, wherein the pigtail is introduced from the brush in a direction toward a motor shaft.
4. The brush holder for the dynamo-electric machine
15 according to Claim 2, wherein the pigtail is introduced from the brush in a direction toward a motor shaft.
5. The brush holder for the dynamo-electric machine according to Claim 1, wherein a column is located in the terminal plate to connect with the pigtail.
- 20 6. The brush holder for the dynamo-electric machine according to Claim 2, wherein a column is located in the terminal plate to connect with the pigtail.
7. The brush holder for the dynamo-electric machine according to Claim 3, wherein a column is located in the
25 terminal plate to connect with the pigtail.
8. The brush holder for the dynamo-electric machine according to Claim 1, wherein the pigtail is introduced

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from a backside of the brush.

9. The brush holder for the dynamo-electric machine according to Claim 2, wherein the pigtail is introduced from a backside of the brush.

5 10. The brush holder for the dynamo-electric machine according to Claim 3, wherein the pigtail is introduced from a backside of the brush.

11. The brush holder for the dynamo-electric machine according to Claim 4, wherein the pigtail is introduced
10 from a backside of the brush.

12. The brush holder for the dynamo-electric machine according to Claim 1, wherein the dynamo-electric machine is rotatable in both directions.

13. The brush holder for the dynamo-electric machine
15 according to Claim 2, wherein the dynamo-electric machine is rotatable in both directions.

14. The brush holder for the dynamo-electric machine according to Claim 3, wherein the dynamo-electric machine is rotatable in both directions.

20 15. The brush holder for the dynamo-electric machine according to Claim 4, wherein the dynamo-electric machine is rotatable in both directions.

16. The brush holder for the dynamo-electric machine according to Claim 5, wherein the dynamo-electric machine
25 is rotatable in both directions.

17. The brush holder for the dynamo-electric machine according to Claim 1, wherein the dynamo-electric machine

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ABSTRACT OF THE DISCLOSURE

Terminal plates 1 and 3 are located in a brush
holder base 2, a spring 4 and a brush 6 are located in
the brush holder base 2, the terminal plates 1 and 3 are
5 connected to pigtails 6a, 12 in an area within 90° in a
backside of an introducing portion of the pigtails in the
brush 6, whereby ripples of torque of a dynamo-electric
machine are reduced, and an operating noise is reduced.

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FIG. 1

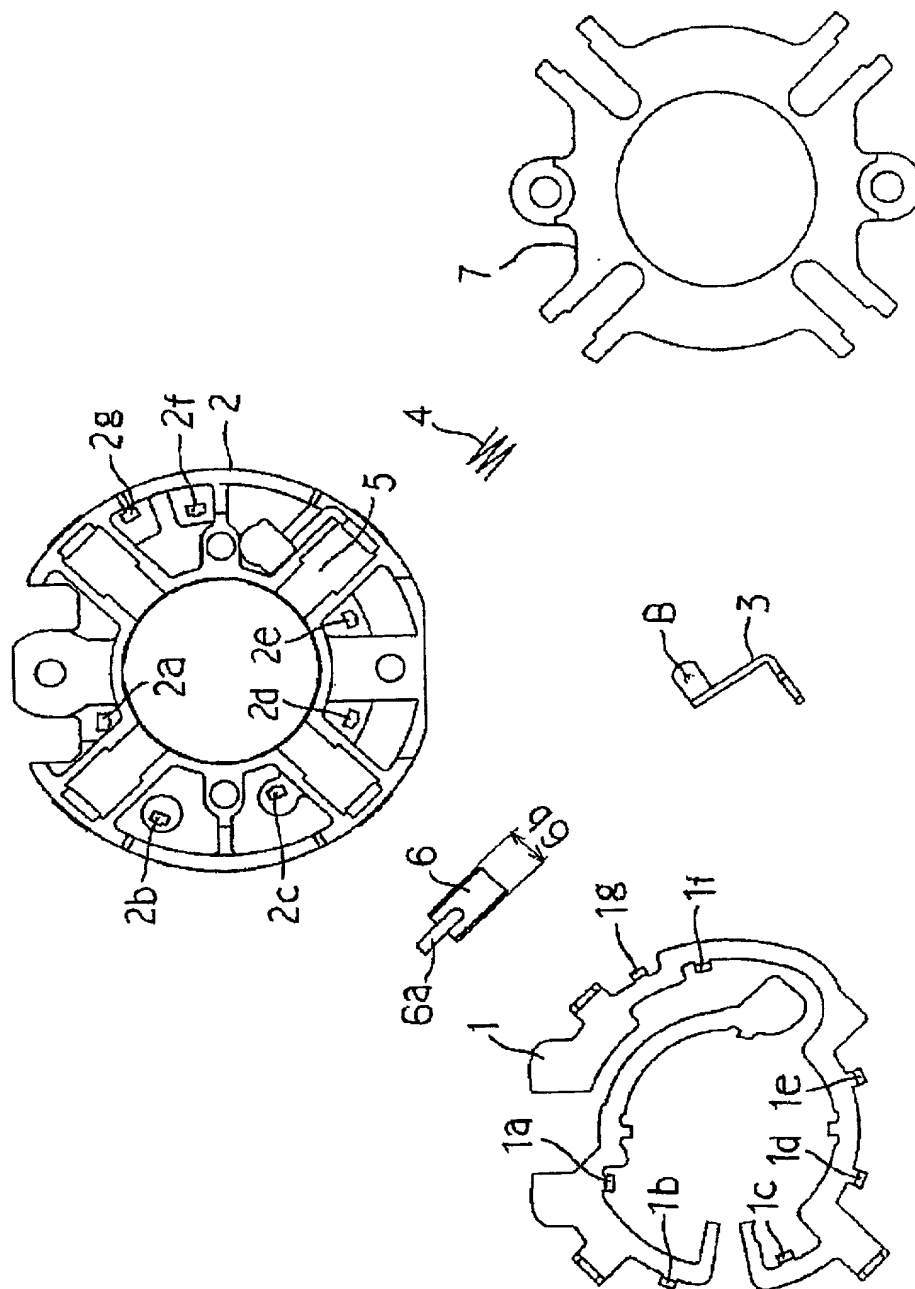


FIG. 2

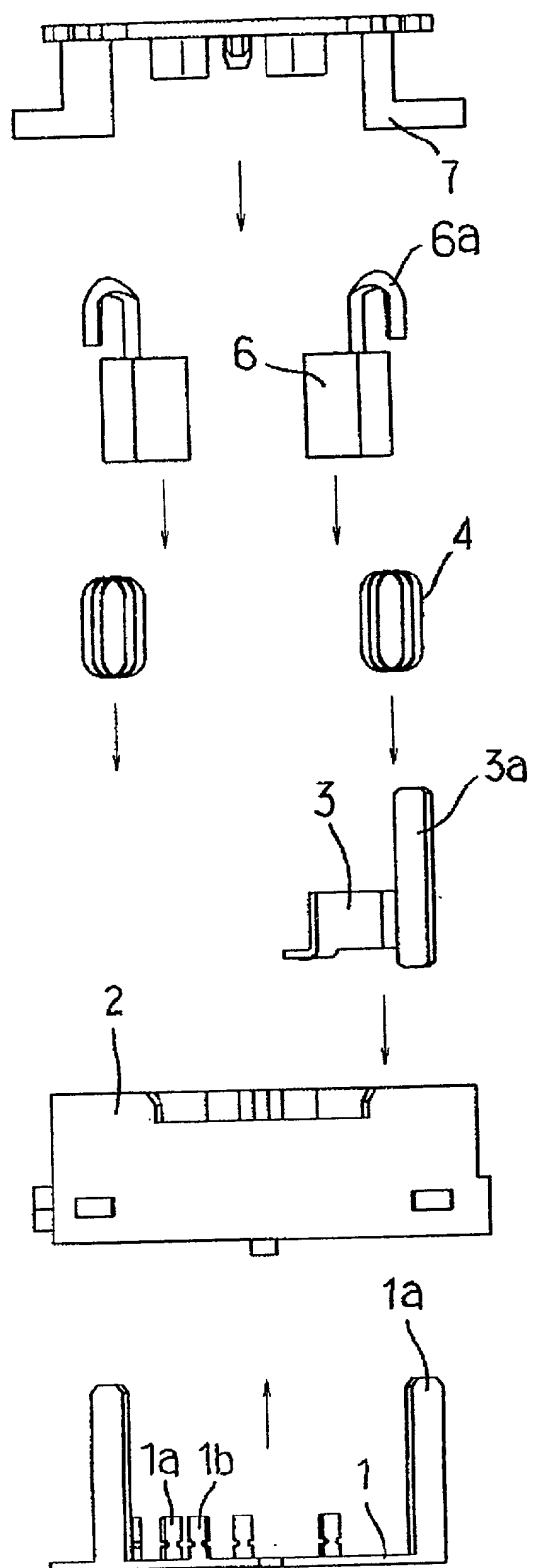


FIG. 3

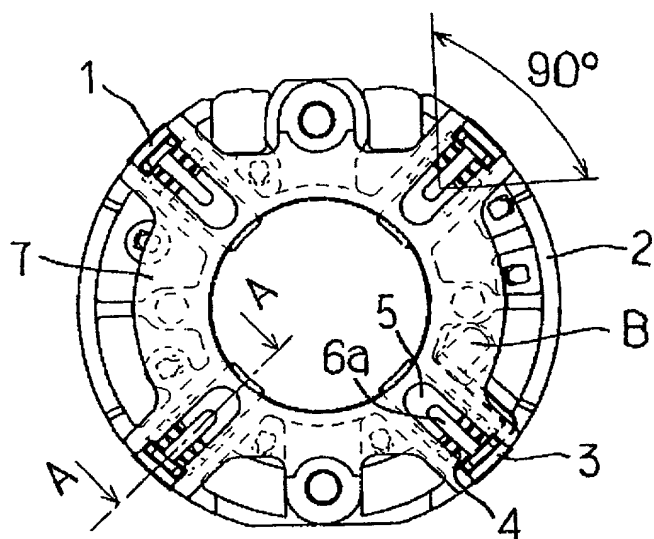


FIG. 4

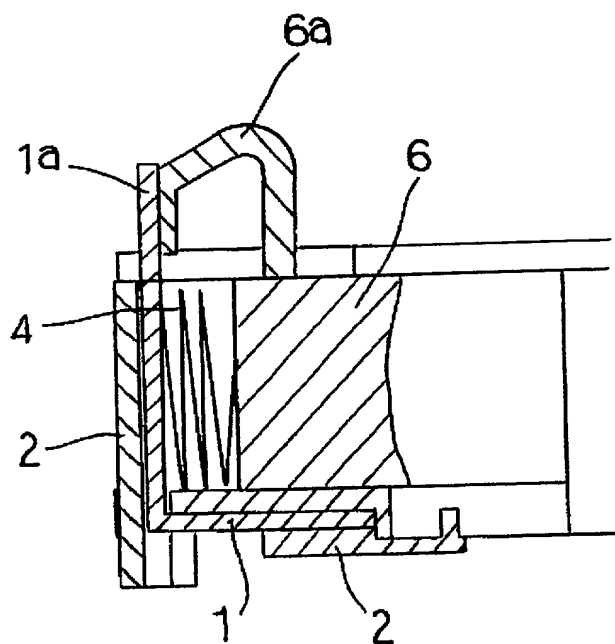


FIG. 5

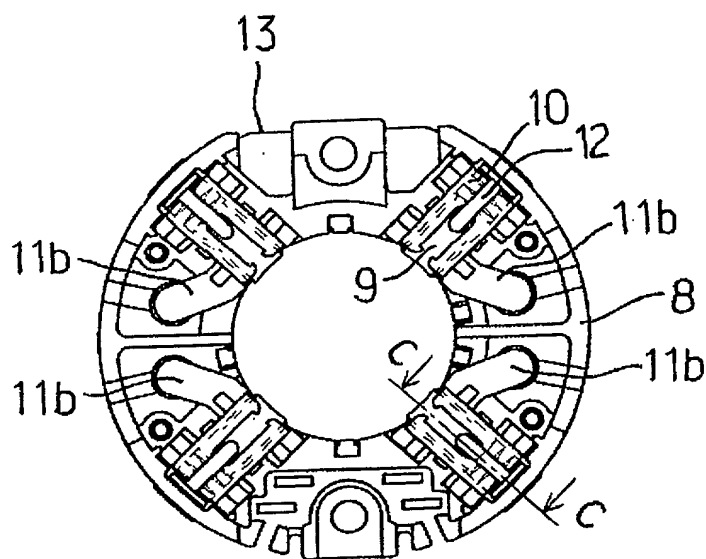


FIG. 6

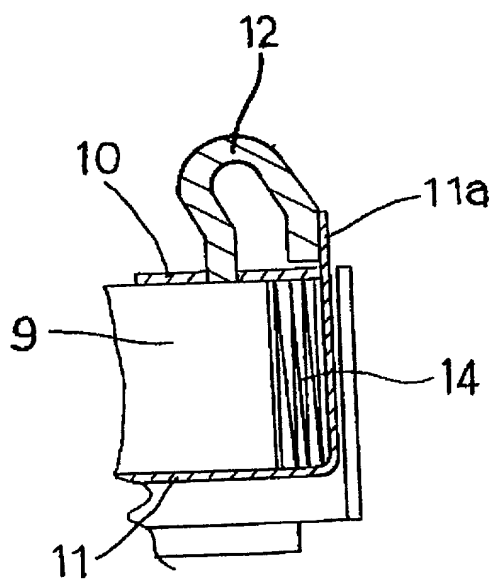


FIG. 7

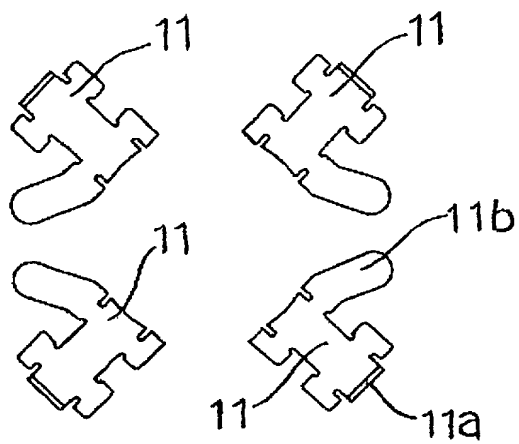


FIG. 8

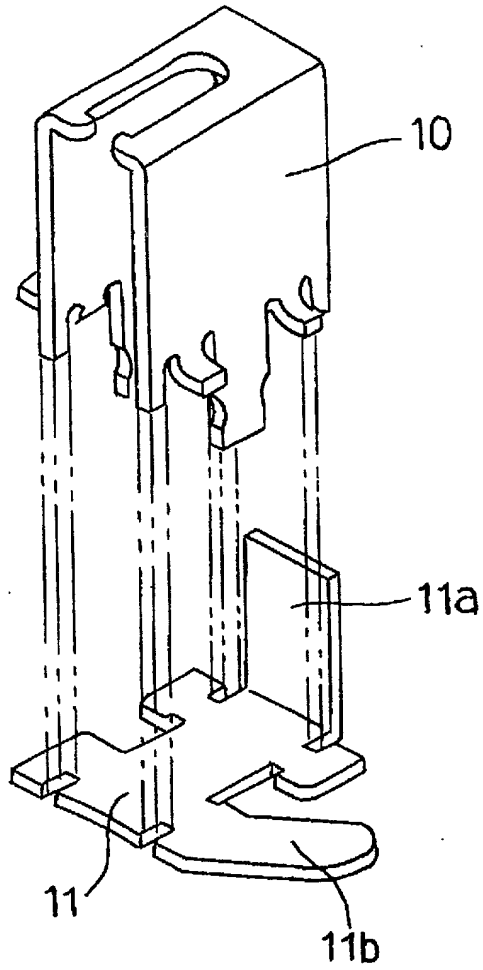


FIG. 9

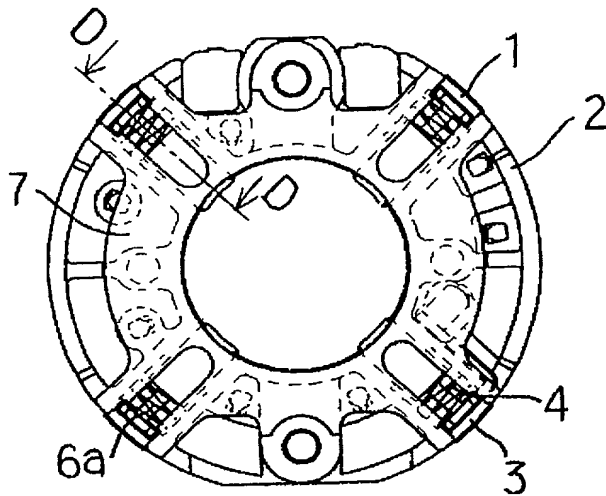


FIG. 10

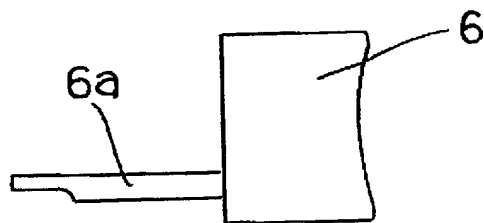


FIG. 11

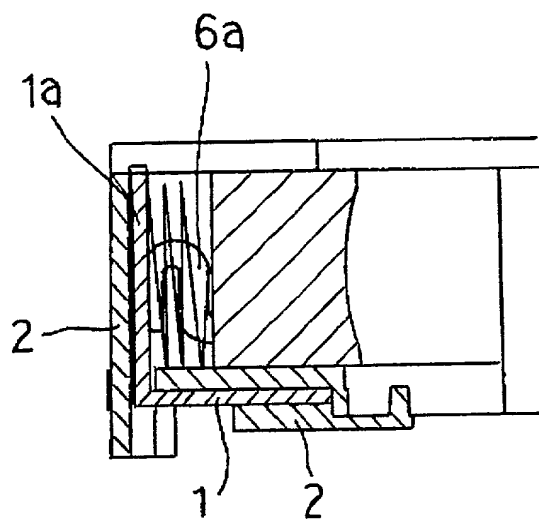


FIG. 12a

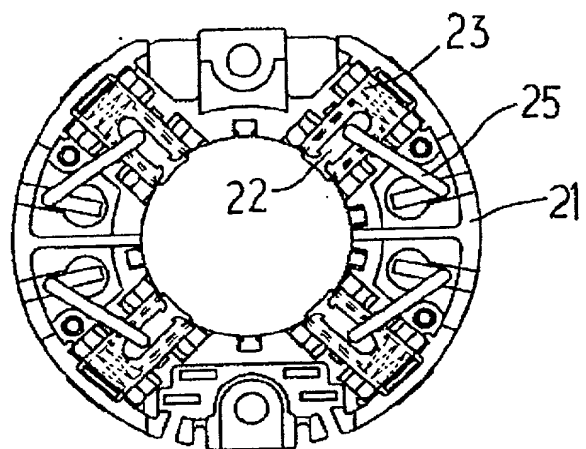


FIG. 12b

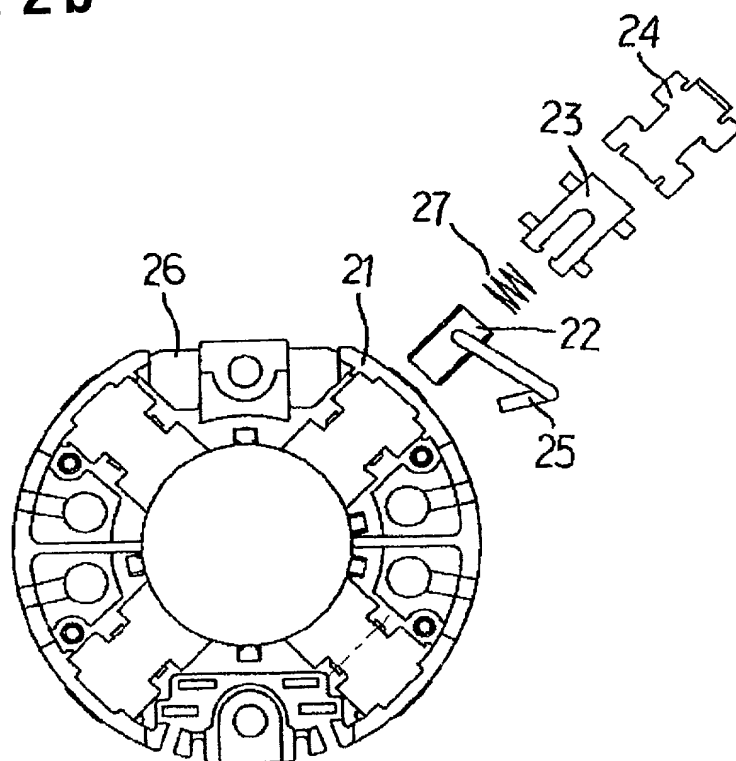
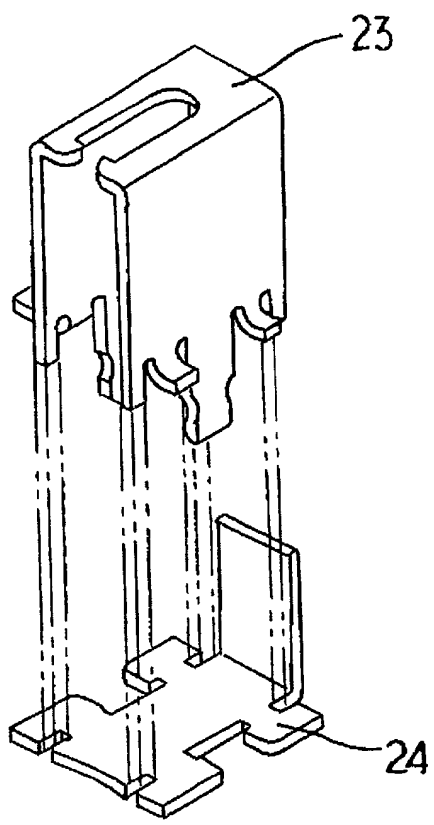
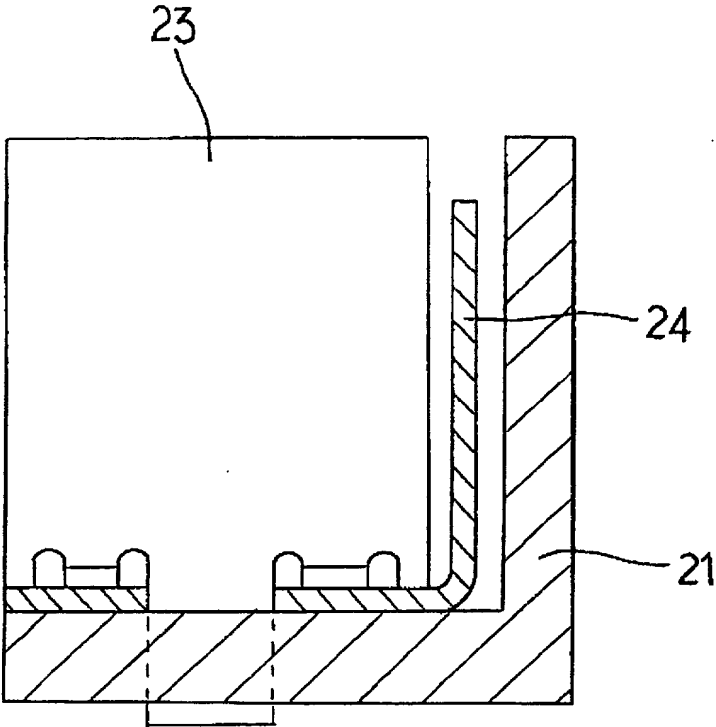


FIG. 13



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FIG. 14



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Declaration and Power of Attorney for Patent Application

特許出願宣言書

Japanese Language Declaration

私は、下欄に氏名を記載した発明として、以下の通り宣言する：

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおりであり、

名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、最初にして唯一の発明者である（一人の氏名のみが下欄に記載されている場合）か、もしくは本来の、最初にして共同の発明者である（複数の氏名が下欄に記載されている場合）と信じ、

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

BRUSH HOLDER FOR DYNAMO-ELECTRIC

MACHINE

その明細書を
(該当するほうに印を付す)

☐ ここに添付する。

☐ _____ 日に出願番号

第 _____ 号として提出し、

_____ 日に補正した。
(該当する場合)

the specification of which
(check one)

☒ is attached hereto.

☐ was filed on _____ as

Application Serial No. _____

and was amended on _____
(if applicable)

私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討し、理解したことを陳述する。

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37部第1章第56条(a)項に従い、本願の審査に所要の情報を開示すべき義務を有することを認める。

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Japanese Language Declaration

私は、合衆国法典第35部第119条、第172条、又は第365条に基づく下記の外国特許出願又は発明者証出願の外国優先権主張を主張し、さらに優先権の主張に係わる基礎出願の出願日前の出願日を有する外国特許出願又は発明者証出願を以下に明記する：

I hereby claim foreign priority benefits under Title 35, United States Code §119, §172 or §365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior foreign applications
先の外国出願

			Priority claimed 優先権の主張	
2000-258695	Japan	29/August/2000	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)	Yes あり	No なし
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)	Yes あり	No なし
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)	Yes あり	No なし
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)	Yes あり	No なし
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)	Yes あり	No なし

私は、合衆国法典第35部第120条に基づく下記の合衆国特許出願の利益を主張し、本願の請求の範囲各項に記載の主題が合衆国法典第35部第112条第1項に規定の態様で先の合衆国出願に開示されていない限度において、先の出願の出願日と本願の国内出願日又はPCT国際出願日の間に公表された連邦規則法典第37部第1章第56条(a)項に記載の所要の情報を開示すべき義務を有することを認める。

I hereby claim the benefit of Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose any material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (出願番号)	(Filing Date) (出願日)	(現況) (特許済み、係属中、放棄済み)	(Status) (patented, pending abandoned)
_____	_____	_____	_____
(Application Serial No.) (出願番号)	(Filing Date) (出願日)	(現況) (特許済み、係属中、放棄済み)	(Status) (patented, pending abandoned)
_____	_____	_____	_____

私は、ここに自己の知識に基づいて行った陳述がすべて真実であり、自己の有する情報及び信ずるところに従って行った陳述が真実であると信じ、更に故意に虚偽の陳述等を行った場合、合衆国法典第18部第1001条により、罰金もしくは禁固に処せられるか、又はこれらの刑が併科され、又はかかる故意による虚偽の陳述が本願ないし本願に対して付与される特許の有効性を損なうことがあることを認識して、以上の陳述を行ったことを宣言する。

I hereby declare that all statements made herein of my own knowledge are true; and further that all statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Japanese Language Declaration

委任状： 私は、下記発明者として、以下の代理人をここに
 選任し、本願の手続きを遂行すること並びにこれに関する一
 切の行為を特許商標局に対して行うことを委任する。
 (代理人氏名及び登録番号を明記のこと)

POWER OF ATTORNEY: As a named inventor, I hereby
 appoint the following attorney(s) and/or agent(s) to
 prosecute this application and transact all business in the
 Patent and Trademark Office connected therewith (*list
 name and registration number*)

I hereby appoint John H. Mion, Reg. No. 18,879; Donald E. Zinn, Reg. No. 19,046; Thomas J. Macpeak, Reg. No. 19,292;
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 No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; and Brett S. Sylvester, Reg. No. 32,765, my
 attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and
 request that all correspondence about the application be addressed to SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC, 2100
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同発明者の署名	日付	Inventor's signature Date
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(第三又はそれ以降の共同発明者に対しても同様な情報
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(Supply similar information and signature for third and
 subsequent joint inventors.)

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同第三発明者の署名	日付	Third inventor's signature Toshinori Tanaka	Date October 15, 2000
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第六の共同発明者の氏名（該当する場合）		Full name of sixth joint inventor, if any	
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